Switching to Water-Based Solutions for Parts Cleaning

BAPPG Bay Area Pollution Prevention Group

Switching to Water-Based Solutions for Parts Cleaning

Introduction

Maintenance parts cleaning has been done for years using solvent-based cleaners such as mineral spirits. Now many shops are making the switch to water-based cleaners, for several reasons:

- New laws limit the use of solvent-based cleaners.
- Worker safety is a concern when workers breathe or make skin contact with solvents.
- In the long run, water-based cleaning systems can save a shop money, because aqueous cleaners often cost less and, in many cases, they can be used longer.

However, if improperly handled, water-based cleaners can also cause significant pollution problems for the Bay and local creeks. The purpose of this booklet is to help you to switch to water-based cleaners—without causing water quality problems.

What's the problem with mineral spirits?

Mineral spirits contain volatile organic compounds (VOCs) that produce smog and cause health problems. They can also contain chemicals such as benzene, an established human carcinogen; toluene, which causes central nervous system damage; and xylene, known to cause birth defects. The new low-vapor-pressure mineral spirits often contain n-methyl pyrollidone, a reproductive and developmental toxin.

A new regulation for Bay Area parts cleaners

Effective September 1, 1999, the Bay Area Air Quality Management District (BAAQMD) will limit the amount of solvent-based cleaner shops can use without a permit. This regulation is intended to reduce the addition of VOCs to the atmosphere.

Under the new regulation, each shop will be allowed a single cold cleaner with maximum solvent loss of 20 gallons per year. Any additional cleaner must either be permitted, or use a cleaning product with a maximum of 50 grams per liter, or 5 percent VOCs (most organic solvents are 100 percent VOCs).

Pertinent excerpts from the new regulation may be found on page 11. For more information on the rule and how it may apply to your shop, call the BAAQMD at the number listed on page 12.

Preventing water pollution

Water-based cleaners used on dirty parts pick up toxic metals like lead, cadmium, copper, and zinc. Metals pass through wastewater treatment plants into the Bay, where they accumulate in the food web. Spent aqueous cleaners rarely meet the standards for sewer disposal and usually must be hauled off site.

Disposal of any waste cleaners on the ground or into storm drains will cause toxic pollution in creeks or the Bay where storm drains empty. Even biodegradable soaps can kill fish. In general, discharge of any substance other than rainwater into storm drains or creeks is illegal.

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Water-Based Cleaning Products

Important considerations in choosing cleaning products include:

- *Whether a particular product will work with the type of equipment you choose*
- *Life expectancy of solutions*
- *Worker exposure concerns (hand contact, odors, hazardous fumes, etc.)*
- *Even non-toxic, biodegradable products can become hazardous waste after use.*

Product characteristics

Acid, Alkaline or Neutral: Solutions that are acidic (pH significantly below 7) or alkaline (pH significantly above 7) can damage workers' skin and should only be used in equipment that does not require hand contact. Neutral solutions should be used wherever there is a chance of skin contact with the solution.

Solvent Additives: Some cleaners contain solvents such as glycol ethers, alcohols or terpenes. Depending on concentration and exposure, solvent additives may be hazardous for workers either through skin contact or inhalation. Some solvent additives may also cause the solution to exceed the VOC limit in the new regulation. Businesses should choose water-based cleaners without solvent additives.

Emulsifying vs. Rejecting: Cleaners that reject oil contain surfactants that cause oil to float to the top of the cleaning bath when the bath sits for a period of time. The oil can then be physically removed with absorbents, rags, filters, or skimmers. Removing the oil allows the cleaner to be used longer. Depending on the oil loading, oil-rejecting cleaners may have a bath life of several months.

Emulsifiers help oil and water to mix. Cleaners that emulsify oil become spent much more quickly. For this reason, emulsifying solutions should be avoided, except when using an enzyme cleaning system.

Enzyme Cleaning Formulations: Enzyme cleaning systems rely on microbes to break down oil and must be specially designed to support their growth. These formulations emulsify the oil to keep it in the water and available as food for the microbes. They must also be neutral because the microbes will not survive in highly acidic or alkaline solutions.

Water-Based Cleaners and Worker Safety

Some water-based cleaning products may be hazardous for workers who use them due to high or low pH, or because they contain solvent additives such as terpenes or glycol ethers. Safety equipment including gloves and eye protection should be encouraged with all parts cleaning operations.

Water-Based Cleaning Equipment

In choosing equipment, consider:

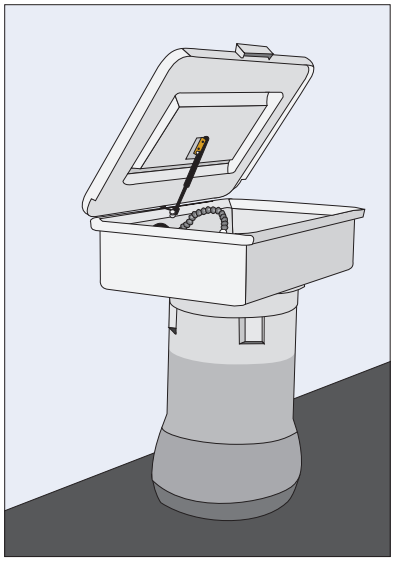
- *Whether the equipment will accept the type of cleaning product you prefer*
- *Labor costs can be more important than equipment cost, so automated units can save you money in the long run.*
- *Exposure of workers through hand contact, fumes, etc.*

Types of Equipment

Numerous types of cleaning equipment can be used with water-based cleaners. All use energy to heat the solution and, in the case of ultrasonic cleaners, to generate sound. The five major equipment types are described below.

Sink-On-A-Drum

This most common type of equipment consists of a sink mounted on a drum of water-based cleaner. The sink is equipped with a drain, a faucet, and a flow brush for cleaning the parts. The water-based cleaner is heated to about 105° F. Many units have filters for removing particulates and oil; some units include oil skimmers. Workers' hands contact the cleaner, so product formulations should have a neutral pH to prevent skin damage.



Enzyme Cleaning System

These systems are generally sink-on-a-drum units, used with a neutral, emulsifying cleaning formulation. The enzyme cleaning formulation supports the growth of microbes that biodegrade or break down oil. The microbes are introduced directly into the solution or in a filter. The formula is heated to a temperature that supports microbial growth, about 105° F. Because the bath cleans itself, it can last for months or even years without requiring changeout.

Choosing a Vendor

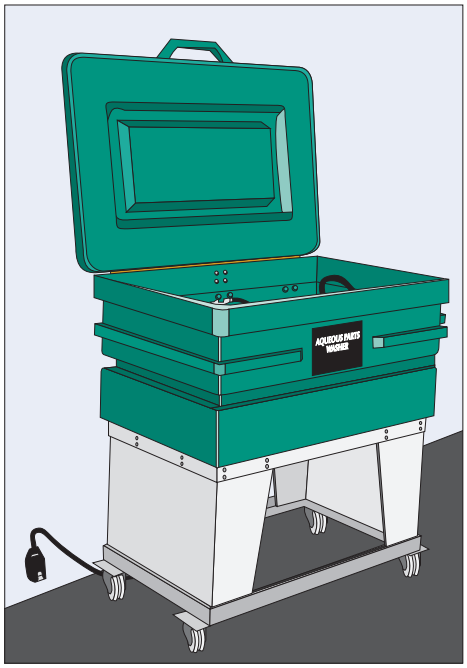
In Southern California, new and more stringent air quality protection laws are creating a very high demand for water-based cleaners and equipment. There are a number of vendors capitalizing on this demand. Some of these companies are providing well tested products and equipment and others are not.

Contact several vendors as well as referrals before you settle on products, equipment, or services. Seriously consider choosing an equipment vendor that provides regular servicing. Insist on testing equipment before you purchase it.

For suggested questions to ask vendors and referrals, see the list at the end of this booklet.

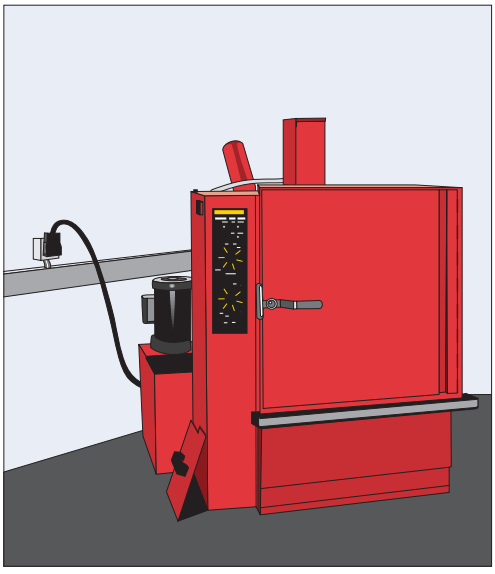
Immersion Parts Washer

This type of unit consists of a sink with a bottom that can be removed or opened so the parts can soak in a reservoir below. As with a sink-on-a-drum, there can be a faucet and a flow brush for hand-detailing the parts. The units are heated and can contain filters and oil skimmers. Both metal and plastic units are available.



Spray Cabinet

Parts are placed inside the cabinet and the door is closed and latched. High-pressure spray from nozzles flushes the parts and cleans them just like a dishwasher. The formulation, either neutral or alkaline, is heated to between 120° and 180° F. These units are made of metal and often have filters or oil skimmers. Because they are automated, spray cabinets reduce labor costs. They also clean more aggressively than other equipment.



Choosing the best equipment for your shop

- If your shop is small with only one mineral spirits parts cleaner, your workers devote a small amount of time to cleaning and you have light contamination, a sink-on-drum or an enzyme system will be best.
- If you have multiple parts cleaners and devote a lot of time to parts cleaning, a spray cabinet will help reduce the labor cost.
- If you clean many transmissions, carburetors, or fuel injectors, an ultrasonic cleaning unit may be the most effective choice.

Ultrasonic System

These systems rely on sound energy to accomplish cleaning. The energy creates bubbles that explode in crevices and holes to clean the parts. These systems are most appropriate for cleaning complex parts like transmissions and carburetors. Higher pH (alkaline) cleaners can be used in these units since workers' hands do not contact the cleaner. The solution is heated. Like spray cabinets, these automated systems reduce labor costs.

Rinsing Parts

Rinsing is often not necessary. If you do need to rinse:

- Use as little water as possible.
- When possible, rinse over the tank.
- Do not rinse outside.
- See page 8 for information on sewer discharges.

Guidelines for Selecting Water-Based Cleaning Equipment

Equipment Type	Product Formulation Options	Hand Scrub or Automated	Considerations	Applications	Equipment Cost
Sink-on-a-drum	Neutral	Hand scrub	Low equipment cost	Replaces single solvent sink	$500-$1,500
Enzyme system	Neutral	Hand scrub	Extends bath life Minimizes waste generation	Replaces single solvent sink	$1,000-$1,500
Immersion unit	Neutral	Hand scrub	Parts can be soaked	For parts that need soaking	$800-$1,700
Spray cabinet	Neutral or alkaline	Automated	Low labor cost 220 required	One unit can replace several solvent sinks Aggressive cleaning	$2,000-$6,000
Ultrasonic unit	Neutral or alkaline	Automated	Low labor cost	Aggressive cleaning for intricate parts, e.g. fuel injectors, transmissions, carburetors	$3,000-$12,000

Management and Disposal of Water-Based Cleaning Waste

The following information will help you to prevent pollution and comply with environmental regulations.

Hauling off-site: The best strategy for disposal of cleaning solutions

In a study performed in Southern California[†], it was found that most spent water-based cleaning baths were classified as hazardous waste because they have toxic concentrations of metals like lead, cadmium, copper and zinc. Used filters can also contain high enough concentrations of toxic metals to be hazardous.

If your waste is hazardous:

- It must be stored according to hazardous waste storage requirements.
- A licensed hazardous waste transporter must haul the waste to a licensed hazardous waste disposal or recycling facility.

No hazardous waste is allowed in the sewer, the storm drain, or the garbage.

You can have your waste tested to see if it is hazardous, but it is expensive. Analyzing one sample may cost between $200 and $400. Because of the expense, the best strategy for many companies is to assume it is hazardous and ship all cleaner-related materials (solutions, sludge, and filters) off-site.

What is a Hazardous Waste?

Hazardous waste is legally defined in the California Code of Regulations, Title 22, Chapter 11. A hazardous waste is a material (requiring disposal) that is listed in the regulations, or that has one of the following properties: toxic, ignitable, corrosive, or reactive.

Transport Your Own Waste — and Save Money!

As an alternative to contracting with a hazardous waste hauler, participate in a small business hazardous waste collection program. In many communities these programs are open to "Conditionally Exempt Small Quantity Generators" (CESQGs). A CESQG generates no more than 27 gallons of hazardous waste per month (not including wastes that are recycled such as motor oil and antifreeze). You will be charged a fee to take your waste to the collection site, but it is usually less expensive than using a hazardous waste hauler. Call 510-540-3739 for information on a program in your area.

[†]Institute for Research and Technical Assistance (IRTA), Document No. 614, *Parts Cleaning in Auto Repair Facilities: Conversion to Water*, April 1997. Available from Department of Toxic Substances Control, Office of Pollution Prevention and Technology Development (see resource list p. 12).

Discharging aqueous cleaning wastes to the sewer

Some Bay Area wastewater treatment plants prohibit discharge of spent water-based cleaners or rinses to the sewer. Others will allow these wastes to be sewered only after they are tested, found to be non-hazardous and in compliance with discharge limits, and a permit is obtained. Check with your local treatment plant for more information. (Find the phone number in the resource list beginning on page 12 of this booklet.)

None of the baths tested in the Southern California study met discharge standards set by wastewater treatment plants. Most importantly, these baths exceeded toxic metal limits. All of them exceeded oil and grease limits.

Treating aqueous cleaning waste

Treatment of spent water-based cleaning baths to meet sewer discharge limits may be possible. However, treatment systems that only provide oil separation and solids settling will not remove dissolved metals in the spent baths. A permit will usually be required by the local wastewater treatment plant.

If a company decides to treat—or evaporate—the spent cleaning bath and it is hazardous waste, a tiered permit from a local Certified Unified Program Agency (CUPA) or the CalEPA's Department of Toxic Substances Control (DTSC) will be required. See the resources section at the end of this booklet.

If you have questions regarding sewer disposal call the number in the resource section for your local wastewater treatment plant.

Spent filters, filter sludge, and skimmer wastes

These concentrated wastes are likely to contain enough metals to qualify as hazardous. To reduce waste generation and associated costs, choose a system with a permanent filter that you can empty and reuse. Oil collected by skimmers in the parts cleaners can be combined with other used oil for recycling.

Prevent mixed wastes!

Workers should never use brake cleaner, engine cleaner, or other solvent cleaning products—especially chlorinated solvents—near or in a parts cleaner. These materials commonly contain solvents (often the more hazardous chlorinated-type solvents) that will contaminate the spent water cleaning bath and guarantee classification as a hazardous waste. Such solvent cleaning products can also destroy the microbes in an enzyme cleaning system. If this occurs, the bath will have to be changed out.

Reduce Waste and Save on Disposal Costs

Prevent pollution and save money by extending your bath life. To extend bath life:

- Choose cleaning products that reject rather than emulsify oil, so oil floats to the top for skimming.
- Use enzyme systems with microbes to "eat" the oil.
- Use filters to remove particles.

Information to Request from Vendors

Before you purchase products, equipment, or services be sure to discuss the following considerations with vendors:

Equipment

1. Referrals to shops using the equipment
2. Option to test equipment prior to purchase
3. Lease/buy options
4. Operation and maintenance (O&M) services
5. O&M costs (electrical, replacement parts, waste handling)
6. Worker safety concerns (heat, chemical, mechanical, etc.)
7. Equipment to extend bathlife (filters, skimmers, etc.)

Cleaning Products

1. Referrals to shops using the product
2. Does the product have any solvent additives?
3. Is the product neutral, acidic or alkaline?
4. Is the product oil rejecting or emulsifying?
5. Does the product have less than 50 grams per liter VOCs?
6. Be sure to read the material Safety Data Sheet (MSDS) that lists all ingredients.
7. Health concerns (hand contact, fumes, etc.)
8. Product odor (find out if your employees can tolerate the odor before purchasing)
8. Does the vendor offer a waste pick up service?

Waste Hauling

1. Is the company licensed as a hazardous waste hauler?
2. Cost for waste pickup
3. Does the company help with the hazardous waste record keeping requirements (manifests)?
4. Does the waste go to a licensed hazardous waste treatment facility? If so, which? If not, where does the waste go?

Information to Request from Referral Shops

Before you purchase products, equipment, or services it's a good idea to discuss the following with other shops that have experience with water-based cleaning technology.

Equipment

1. Cleaning effectiveness
2. Labor costs
3. Operation and maintenance costs
4. Employee comments
5. Bath life (How often do they change the cleaning bath?)
6. Use of filters or skimmers to extend the bath life

Cleaning Products

1. Is the recommended dilution effective?
2. Employee comments
3. How are wastes handled?

Waste Hauling Services

1. Adequacy of service
2. Cost of service

Remember, although vendors may claim that their products are non-toxic or biodegradable, this does not mean that used parts cleaning solutions can go down the sewer or are safe for the environment! Call your local wastewater treatment plant for more information. Numbers to call are on pages 12–14.

Excerpts from the New Regulation

Bay Area Air Quality Management District Regulation 8, Rule 16: Solvent Cleaning Operations

Limitation: 8-16-303.5

Effective September 1, 1999, the VOC content of the cleaning solution used in a cold cleaner shall not exceed 50 g/l (0.42 lb./gal). Cold cleaners meeting the requirements of this section are not required to comply with subsection 8-16-303.4.

Exemption: 8-16-121

Limited Exemption, Single Cold Cleaner: Effective September 1, 1999, the VOC content limitation in Section 8-16-303.5 for cleaning solutions used in cold cleaners does not apply to one cold cleaner per facility, provided that annual solvent loss from that cold cleaner does not exceed 20 gallons per year.

Exemption: 8-16-122

Limited Exemption, Permitted Cold Cleaners: Effective September 1, 1999, the VOC content limitation in Section 8-16-303.5 for cleaning solutions used in cold cleaners does not apply to any cold cleaner for which a District permit to operate has been obtained pursuant to Regulation 2, Rule 1.

Pollution Prevention Resources

Air Quality

Bay Area Air Quality Management District (BAAQMD)

Permit Services Division	(415) 749-4990
Compliance Counselor	(415) 749-4999

Web site: www.baaqmd.gov

Hazardous Waste

CalEPA Department of Toxic Substances Control

Bay Area Duty Officer	(510) 540-3739
Office of Pollution Prevention and Technology Development	(916) 322-3670 (phone) (916) 327-4494 (fax)

Web site: www.calepa.net

Local Wastewater Treatment Plants

Alameda County

City of Hayward	(510) 881-7900
City of Livermore	(510) 373-5230
City of San Leandro	(510) 577-3434
Dublin San Ramon Services District	(925) 846-4565
East Bay Municipal Utility District (EBMUD)	(510) 287-1651
Oro Loma Sanitary District	(510) 276-4700
Union Sanitary District	(510) 790-0100

Contra Costa County

Central Contra Costa Sanitary District	(925) 228-9500
City of Hercules	(510) 724-4637
City of Pinole	(510) 724-8963
City of Richmond	(510) 412-2001
Delta Diablo Sanitation District	(925) 778-4040
Dublin San Ramon Services District	(925) 846-4565

Resource List, continued

Local Wastewater Treatment Plants, continued

Mt. View Sanitary District	(925) 228-5635
Rodeo Sanitation District	(510) 799-2970
Stege Sanitary District (EBMUD)	(510) 287-1651
West County Wastewater District	(510) 237-6603

Marin County

Central Marin Sanitation Agency	(415) 459-1455
Las Gallinas Valley Sanitary District	(415) 472-1734
Marin County Sanitary District #5	(415) 435-1501
Novato Sanitary District	(415) 892-1694
Sausalito-Marin City Sanitary District	(415) 332-0244
Sewerage Agency of Southern Marin	(415) 388-2402

Napa County

City of Calistoga	(707) 942-2837
City of St. Helena	(707) 967-2878
Napa Sanitation District	(707) 258-6000
Town of Yountville	(707) 944-2988

City and County of San Francisco

Public Utilities Commission	(415) 695-7310

San Mateo County

City of Burlingame	(650) 342-3727
City of Millbrae	(650) 259-2388
City of Pacifica	(650) 738-7348
City of San Mateo	(650) 522-7340
City of South San Francisco	(650) 877-8555

North San Mateo County Sanitation District	(650) 991-8200
Sewer Authority Mid-Coastside	(650) 726- 0124
South county served by South Bayside System Authority	(650) 594-8411, ext. 141

Santa Clara County

City of Sunnyvale Water Pollution Control Plant	(408) 730-7260
Regional Water Quality Control Plant (Palo Alto)	(650) 329-2598
San José/Santa Clara Water Pollution Control Plant	(408) 945-3000

Solano County

City of Benicia	(707) 746-4336
Fairfield-Suisun Sewer District	(707) 429-8930
Vallejo Sanitation and Flood Control District	(707) 644-8949

Sonoma County

City of Petaluma	(707) 762-5892
Sonoma County Water Agency	(707) 526-5370

The Bay Area Pollution Prevention Group is grateful to the Pollution Prevention Center of the Institute for Research and Technical Assistance for their help in preparing this booklet.